PHYSICS IN WAR.

Les Applications de la Physique pendant la Guerre. By H. Vigneron. Pp. viii+322. (Paris: Masson et Cie, 1919.) Price 7 francs net.

A BOOK with this title, appearing so soon after the termination of hostilities, could scarcely fail to excite considerable interest. The public in general and people with a scientific turn of mind in particular have been vaguely aware that, during the war, much work has been done in applying scientific principles to military purposes. In this country, as well as in Allied countries, there have been spread, in spite of the censorship, most exaggerated and distorted accounts of the practical results of these experiments. Here, then, in this book, it might have been supposed, would be afforded an opportunity of testing the truth of the rumours which have been current. To a reader in this frame of mind a perusal of the book will be somewhat disappointing. There are no great revelations, and it is a little difficult to see why the French censorship would not allow the author to publish the major portion of the contents during the war as he desired. The important subject of submarine detection and destruction, for example, is dealt with in a couple of pages. There is internal evidence that this does not arise from lack of knowledge on the part of the author, but rather from the operation of the censorship, which can have been removed in a very limited sense only. The author has, no doubt, been seriously handicapped in this way, for the French authorities appear to have been much more strict than our own.

M. Vigneron, in his preface, very properly lays stress on the important part played in the war by those men of science who, before the war, conducted speculative research without thought of the possibility of its practical application, and were forced by circumstances to join hands with the "techniciens," as he calls them. This alliance has produced far-reaching results, and there will be general agreement with the author that it should be fostered and perpetuated. The work of purely scientific workers is very liable to be lost sight of when it becomes absorbed in industry. One feels that M. Vigneron would have been able to do more justice to them had he delayed publication until it was permissible to refer more explicitly to their work. The author is evidently a believer in the practical fruits of pure science, and his advocacy of the methods of the General Electric Co. of Schenectady in this respect is sound.

The first of the seven sections of the present volume deals principally with the applications of optics for military purposes. Of particular interest are the chapters concerning rangefinders, and the many and varied uses of photography in warfare. One misses, however, any adequate reference to modern methods of signalling, such as those with infra-red and ultra-violet light, invented by Prof. R. W. Wood. Sections 2 and 3 are devoted, respectively, to the aerial and submarine aspects of war, and contain many interesting facts and diagrams. There is a long section on artillery and projectiles, containing much information, most of which was probably available before the war. The sixth section, on wireless telegraphy, is shorter than might have been expected, but gives an interesting outline of present methods, including the use of thermionic valves as oscillators and amplifiers. There is merely a mention of wireless telephony, which actually came into considerable practical use during the war. Localisation of foreign materials in the human body, mainly by means of X-rays, forms the subject of the last chapter.

The book is interesting and well written. It is illustrated with many good diagrams and photographic reproductions, which are explained clearly in the text. What is lacking with regard to "secret" developments the author will, we hope, take up in a subsequent volume.

EXPERIMENTAL RESEARCHES ON GLASS.

Experimental Researches Carried Out in the Department of Glass Technology, University of Sheffield. Vol. i., 1917–18. (Reprinted from the Journal of the Society of Glass Technology.) Pp. iii+178. (Sheffield: The University, n.d.)

DR. W. E. S. TURNER is to be congratulated upon the success which has attended the formation of the Department of Glass Technology, Sheffield University, of which he is the head, and of the Society of Glass Technology, of which he is secretary, and in the foundation of which he played a leading part. The results of the experimental researches carried out in the department are now reprinted from the journal of the society, together with certain reports to the council of the university.

Glass is a peculiarly elusive subject for scientific investigation, but neither man of science, technologist, nor practical worker will deny that it is a fascinating one. We know practically nothing about the nature of glass, and in this respect we are much in the position of the metallurgists prior to the introduction of thermal and micrographic methods of investigation. We have as yet no key to the constitution of glass, and this must be sought in the purely scientific study of simple mixtures rather than in the investigation of complex glasses, which experience has proved to be practically useful.

At the beginning of the war very little information was available with regard even to the essential facts relating to scientific glassware, miners' lamps, and electric bulbs, which our glass manufacturers were called upon to supply with the least possible delay. Which was the best of the various brands of beakers and flasks at the moment in everyday use in chemical laboratories? was a question to which only the vaguest answer could be given. As to how these glasses should

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anneal so as to withstand the strain of laboratory use nothing was known at all.

The researches which are now republished relate mainly to the practical class of problems. The seven papers on the testing of laboratory glassware contain information which has been of the greatest value to glass manufacturers. They should also be very carefully studied by everyone engaged in analytical work. The attention of chemists and physicists is also directed to some interesting papers relating to the calibration of volumetric apparatus and to blowpipe work.

Experimental work in connection with refractory materials, furnace problems, etc., is also being undertaken, but only preliminary notes on the results are as yet available.

The publication contains an account of the educational activities of the department, which includes a school of instruction in blowpipe work.

M. W. T.

PHYSICAL CHEMISTRY.

(1) *Text-book of Physical Chemistry.* By Prof. A. T. Lincoln. Pp. viii + 547. (London: G. G. Harrap and Co., Ltd., 1918.) Price 12*s.* 6*d.* net.

(2) *Outlines of Theoretical Chemistry.* By Dr. F. H. Getman. Second edition, thoroughly revised and enlarged. Pp. xvi + 539. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1918.) Price 16*s.* 6*d.* net.

IN the matter of text-books, physical chemistry seems to be coming into its own. It is a healthy sign. Not, indeed, that mere numbers of text-books are any trustworthy measure of the growth and vigour of a science, nor is the unrestricted compilation of them to be encouraged, but physical chemistry is a relatively youthful science, and there is still ample room for individual exposition of the subject.

We have before us two general text-books of physical chemistry of moderate size and scope, and it may be said at once that both can be recommended to students who are commencing the subject. In books of this kind the great difficulty for the writer is to know what to exclude, for, of course, much has to be excluded, and no very detailed discussion of any problem is possible. The two books, although of much the same "standard," naturally exhibit their individuality in this respect. There is one point which should not be overlooked: both books are by American authors. It is evident that physical chemistry is taken much more seriously in America than it is in our own country. The fact is that the Americans, like the Germans before them, have realised the fundamental importance of physico-chemical thinking, not only for advance on the theoretical side, but equally so for technical and industrial progress.

(1) Prof. Lincoln's book is well written, and the fundamental principles are clearly developed and explained. Considerable attention is paid to the laboratory side of the subject. There are a few historical references, which give added interest to the text. Without going into detail, it may be said that optical properties are particularly well treated, as is also the general problem of heterogeneous equilibrium—*e.g.* the phase rule and its manifold applications, the principles of fractional distillation, and the solubility relations of three components. (In the last connection a particularly good account is given of the use of the triangular diagram.) There is likewise a fairly comprehensive discussion of colloids, of non-aqueous solutions, and of the ionising power of a solvent. Except in a few sections, only the most elementary mathematics is employed. This makes the book very suitable for those beginning the subject, but, of course, limits its scope. There are a few misprints—*e.g.* Frick for Fick on p. 434—and a rather remarkable statement on p. 378 in connection with hydration, which is not quite what the author intends. The absence of a name index is perhaps a drawback, and the use of the term *heat-tone* as a translation of *Wärmetönung* is to be deprecated.

(2) Dr. Getman's book, which now reaches its second edition, is an excellent exposition of physical chemistry for those commencing the subject. Again only elementary mathematics is used, and, although numerous thermodynamical results are quoted and applied, the author has not attempted any systematic treatment of the principles of thermodynamics which would have taken him beyond the general aim and scope of the book. It may be mentioned that the subject of conduction of electricity through gases is given much more prominence than is usual in a book of this kind. The same thing is true of the subjects radio-activity, atomic structure, polarisation, and photochemistry. The results of modern research have been incorporated in a skilful manner, and the student is frequently referred to original sources for further information. The presentation of the whole subject is consequently very much up to date. Each chapter is furnished with a set of problems which will be of good service in enabling the student to grasp thoroughly the meaning of what he reads.

W. C. McC. LEWIS.

OUR BOOKSHELF.

Text-book on Practical Astronomy. By Prof. George L. Hosmer. Second edition, revised. Pp. ix + 205. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1917.) Price 9*s.* 6*d.* net.

THE professed object of the author was to satisfy the requirements of civil engineering students, who are unlikely to take up a more advanced study of astronomy, and to produce a text-book intermediate between those formally devoted to astronomy and geodesy, and the short chapter on astronomy generally to be met with in works on surveying. By the lucidity of the explanations and the simplicity of the general treatment of the subject, the book seems well adapted to

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